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June 2000

Mathematics 33

Grade 12 Diploma Examination

Description

Time: This examination was developed to be completed in 2.5 h; however, you may take an additional 0.5 h to complete the examination.

This is a **closed-book** examination consisting of

- 37 multiple-choice and 12 numerical-response questions, of equal value, worth 70% of the examination
- 4 written-response questions worth 30% of the examination

This examination contains sets of related questions.

A set of questions may contain multiple-choice and/or numerical-response and/or written-response questions.

A mathematics data booklet is provided for your reference.

Note: *The perforated pages at the back of this booklet may be torn out and used for your rough work.*

No marks will be given for work done on the tear-out pages.

Instructions

- You are expected to provide your own scientific calculator.
- Use only an HB pencil for the machine-scored answer sheet.
- Fill in the information required on the answer sheet and the examination booklet as directed by the presiding examiner.
- Read each question carefully.
- If you wish to change an answer, erase **all** traces of your first answer.
- Do not fold the answer sheet.
- The presiding examiner will collect your answer sheet and examination booklet and send them to Alberta Learning.
- Now turn this page and read the detailed instructions for answering machine-scored and written-response questions.

Multiple Choice

- Decide which of the choices **best** completes the statement or answers the question.
- Locate that question number on the separate answer sheet provided and fill in the circle that corresponds to your choice.

Example

This examination is for the subject of

- A. biology
- B. physics
- C. chemistry
- D. mathematics

Answer Sheet

(A) (B) (C) (D)

Numerical Response

- Record your answer on the answer sheet provided by writing it in the boxes and then filling in the corresponding circles.
- If an answer is a value between 0 and 1 (e.g., 0.7), then be sure to record the 0 before the decimal place.
- **Enter the first digit of your answer in the left-hand box and leave any unused boxes blank.**

Examples

Calculation Questions and Solutions

The value of $\tan 35^\circ$ to the nearest tenth is

(Record your answer in the numerical-response section on the answer sheet.)

Calculator value: 0.7002075

Value to be recorded: 0.7

**Record 0.7 on the
answer sheet** →

0	.	7
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9

Written Response

The constant term in the quadratic function $y = 2x^2 + 7x + 32$ is _____.

(Record your answer in the numerical-response section on the answer sheet.)

Value to be recorded: 32

Record 32 on the
answer sheet →

3	2		
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Correct-Order Question and Solution

Four angles given below are to be drawn on a coordinate plane in standard position.

- 1 750°
- 2 650°
- 3 460°
- 4 845°

When the principal angles corresponding to the above angles are arranged in order from **lowest** to **highest**, then the order is ___, ___, ___, ___.

(Record **all four digits** of your answer in the numerical-response section on the answer sheet.)

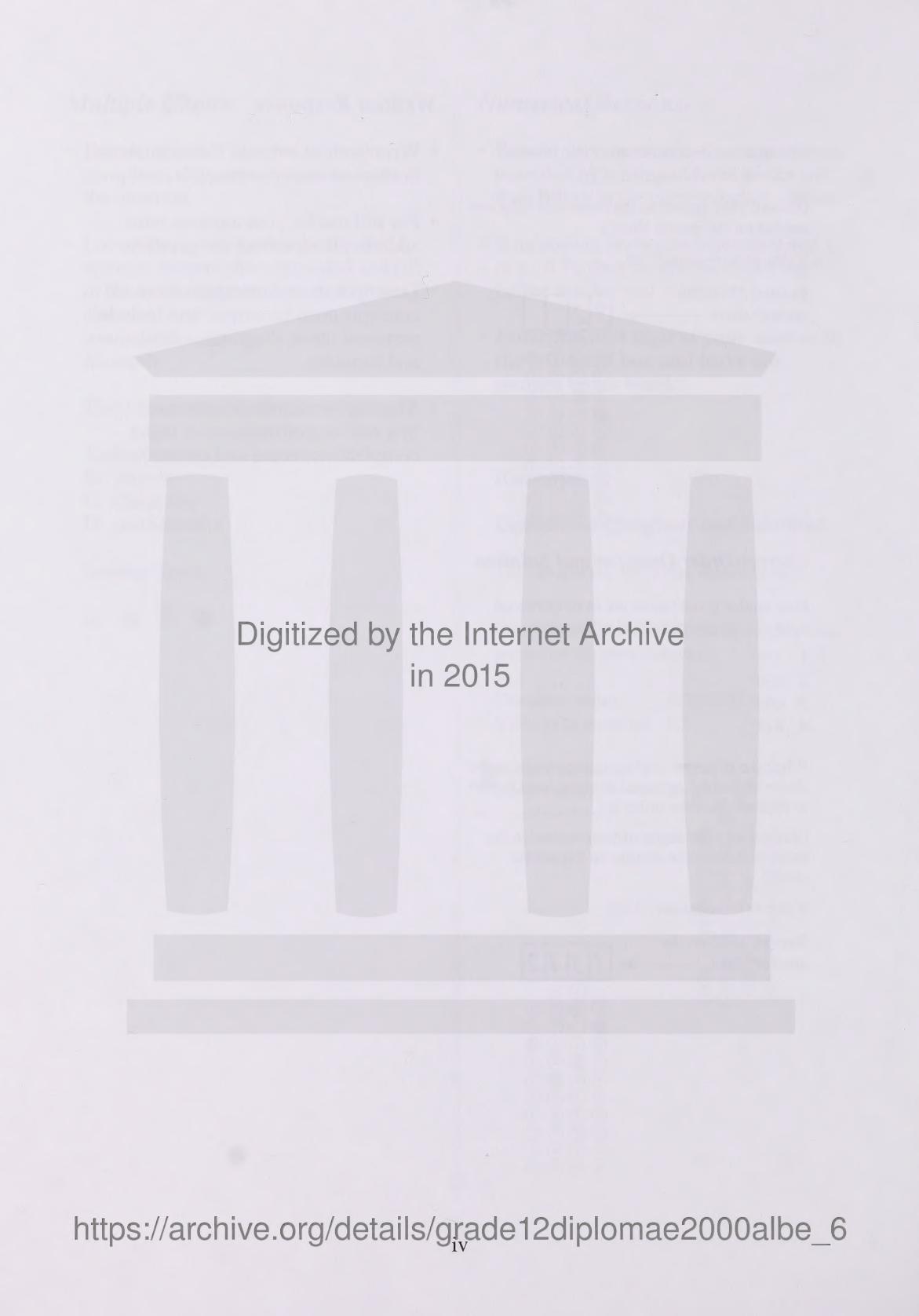
Value to be recorded: 1342

Record 1342 on the
answer sheet →

1	3	4	2
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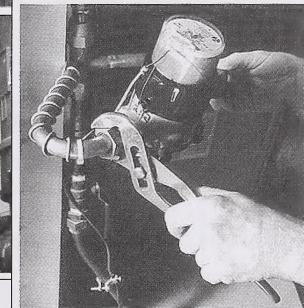
- Write your answers in the examination booklet as neatly as possible.
- For full marks, your answers must address **all** aspects of the question.
- Descriptions and/or explanations of concepts must be correct and include pertinent ideas, diagrams, calculations, and formulas.
- Your answers must be presented in a well-organized manner using complete sentences and correct units.

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ALBERTA INDUSTRY

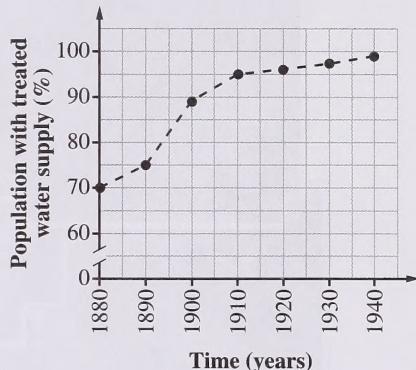
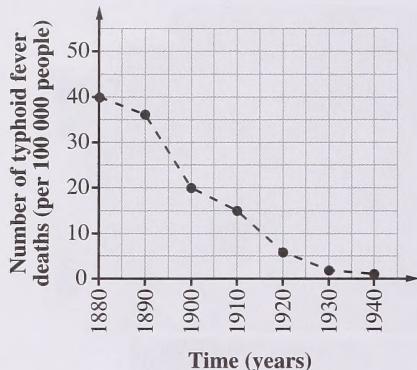
Employees in the Alberta waterworks industry use their mathematical skills to analyze data, make financial decisions, and solve problems. The first set of questions is related to various aspects of this industry.



Use the following information to answer the first three questions.

The management at a water treatment plant analyzed several graphs that reflected the effect of treated water on the health of its recipients in the area the plant served. Two of the graphs are shown below.

The first graph shows the relationship between the number of deaths from typhoid fever per 100 000 people and time in years. The second graph shows the relationship between the percentage of the population with a treated public water supply and time in years.



Between the years 1880 and 1940, the number of deaths from typhoid fever per 100 000 people i and the percentage of the population with a treated water supply ii.

1. The statement above is completed by the words in row

	<i>i</i>	<i>ii</i>
A.	decreased	increased
B.	increased	increased
C.	decreased	decreased
D.	increased	decreased

Numerical Response

1. In 1890, the population in the area was 35 000 people. Of these, the number of people **not** supplied with treated water was _____.

(Record your answer in the numerical-response section on the answer sheet.)

Use the following additional information to answer the next question.

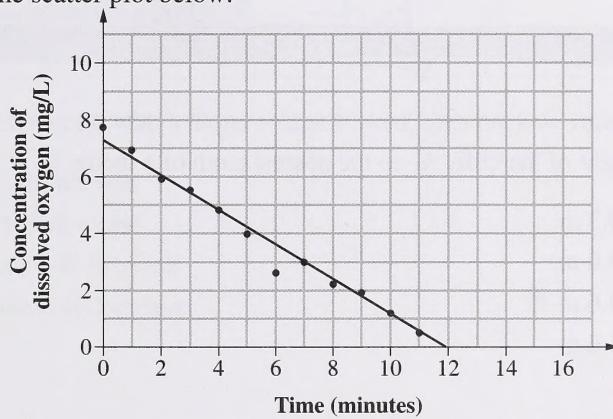
In 1910, 95% of the population in the area was supplied with treated water.

2. If a sample of 80 people were taken from this population and a 90% confidence interval were assumed, then the number of people supplied with treated water in this sample would have been between

- A. 70 and 80
- B. 73 and 79
- C. 90 and 95
- D. 92 and 98

Use the following information to answer the next question.

During wastewater purification, the concentration of dissolved oxygen is affected by the respiration of micro-organisms and changes over time, as shown in the scatter plot below.

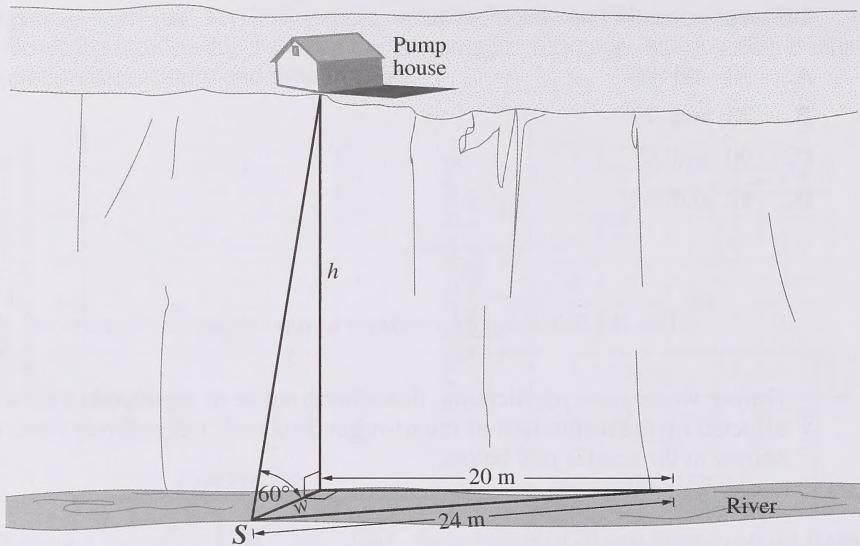


3. The correlation indicated by the scatter plot is

- A. weak and positive
- B. strong and positive
- C. weak and negative
- D. strong and negative

Use the following information to answer the next question.

A pump house is on a cliff h metres above a river that is w metres wide. A surveyor maps out a right triangle across the river with dimensions as indicated in the diagram below. From the surveyor's position, S , the angle of elevation of the pump house is 60° .

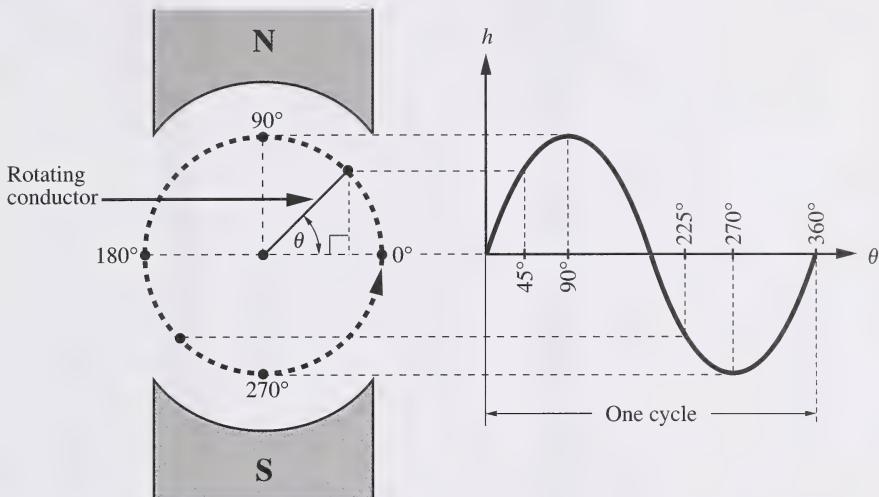


4. The height of the cliff, h , to the nearest tenth of a metre, is

- A. 13.3 m
- B. 23.0 m
- C. 34.6 m
- D. 41.6 m

Use the following information to answer the next question.

When the rotating conductor in a plant generator is rotated past two magnetic poles, the height, h , of a point on the tip of the rotating conductor can be modelled with respect to the rotation angle θ . The rotation produces a sine wave, as shown below.

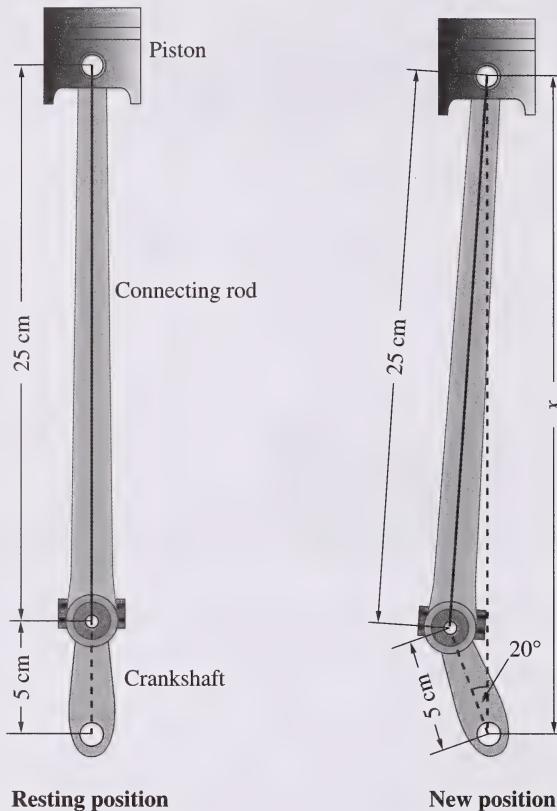


5. If a rotating conductor with a larger radius is used, then the new sine wave's

- A. period will increase
- B. period will decrease
- C. amplitude will increase
- D. amplitude will decrease

Use the following information to answer the next question.

The piston in a water pump engine is attached to a connecting rod that is, in turn, attached to a crankshaft. A technician studied the crankshaft as it moved counter-clockwise from its resting position to a new position, as shown below.

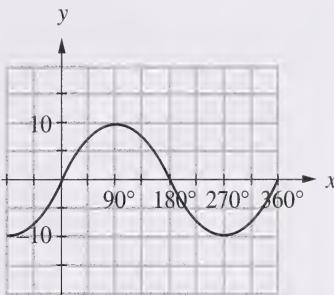


6. The distance x , to the nearest tenth of a centimetre, is

- A. 29.6 cm
- B. 26.6 cm
- C. 25.5 cm
- D. 23.5 cm

Use the following information to answer the next question.

A water pump's rotating gear has a radius of 10 cm. The displacement of this water pump's rotating gear is graphed as a sine wave, as shown below. The graph is related to the function $y = a \sin bx$.

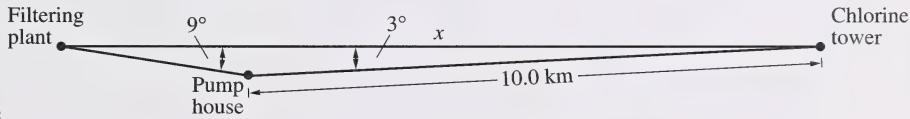


7. The amplitude of the graph is

- A. 360
- B. 90
- C. 20
- D. 10

Use the following information to answer the next question.

A chlorine tower, filtering plant, and pump house are located as shown below.



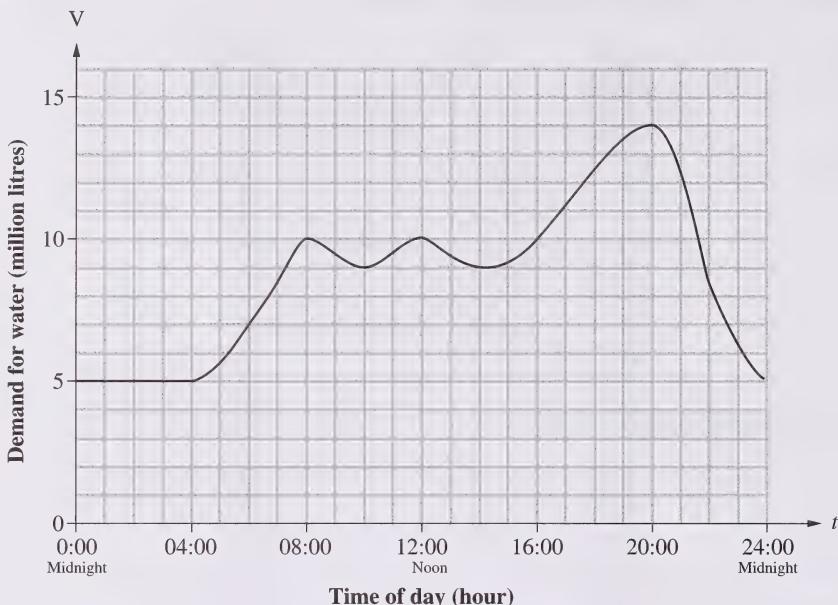
Numerical Response

2. The distance from the filtering plant to the chlorine tower, x , to the nearest tenth of a kilometre, is _____ km.

(Record your answer in the numerical-response section on the answer sheet.)

Use the following information to answer the next question.

The graph below shows the relationship between the time of day and the demand for water, V , in millions of litres, in a particular city.



Written Response—5 marks

- 1.** a. The maximum demand for water is _____ million litres and occurs at _____.

- b. State the range of this function.

c. Using evidence from the graph, **state** the numerical changes in water demand during the periods 04:00 to 08:00, 08:00 to 20:00, and 20:00 to 24:00. **Provide** an explanation for these changing demands.

Use the following information to answer the next question.

The velocity of water moving downstream in a channel is represented by the formula $V = 2\sqrt{RS}$, where V is velocity, R is the hydraulic radius, and S is the slope of the water surface.

An operator at a water treatment plant substituted values for R and S to obtain the equation

$$V = 2\sqrt{48}$$

8. If the expression $2\sqrt{48}$ is simplified further to $a\sqrt{b}$, where a and b are whole numbers, then the lowest possible value for b is

A. 8
B. 6
C. 4
D. 3

Use the following information to answer the next question.

The hydraulic radius, R , of an irrigation channel is represented by the formula

$$R = \frac{A}{P},$$

where A is the area of a cross section and P is the perimeter of the cross section. For a trapezoidal cross section of the irrigation channel, the area, A , and perimeter, P , are given by

$$A = 3h + 2h^2 \text{ and } P = 3 + 2h\sqrt{5},$$

where h is the height in metres.

9. If the height, h , of an irrigation channel is 10 m, then the hydraulic radius, R , to the nearest tenth of a metre, is

A. 204.5 m
B. 141.4 m
C. 17.1 m
D. 4.8 m

Use the following information to answer the next question.

In a particular city, 80 randomly sampled people were asked, “*Should people be permitted to use the water supply reservoir for recreational activities?*” Of those surveyed, 48 people said, “Yes.”

Numerical Response

3. Based on a 90% confidence interval, the highest percentage of the population that would say “yes” to permitting recreational activities on the reservoir is _____ %.

(Record your answer in the numerical-response section on the answer sheet.)

Use the following information to answer the next question.

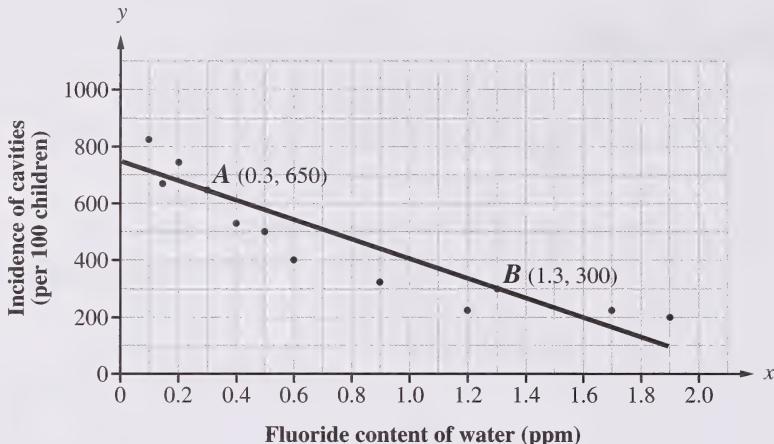
The average monthly water bill for a particular household is \$40.00. After installing a water meter, the family saved an average of \$10.80 per month on their water bill.

10. If the savings of \$10.80 were invested monthly into an annuity at 6% per annum compounded monthly, then the value of the annuity after 3 years would be

- A. \$388.80
- B. \$412.13
- C. \$426.95
- D. \$1 363.70

Use the following information to answer the next question.

The scatter plot below compares the incidence of cavities per 100 children and the fluoride content of water in parts per million (ppm) in a particular area. A student analyzing this data included a line of best fit.



Numerical Response

4. Given the points $A(0.3, 650)$ and $B(1.3, 300)$ on the student's line of best fit, the equation of the line of best fit can be written in the form $y = mx + b$, where m and b are integers. The value of m , a **negative** number, is _____.

(Record your answer in the numerical-response section on the answer sheet.)

Use the following information to answer the next question.

To make an upgrade and addition to the water treatment plant, management obtained a 15-year mortgage for \$20 000 000 at an interest rate of 6% per annum.

11. The monthly payment on the \$20 000 000 mortgage can be calculated using the appropriate table and the expression

A. $20\ 000\ 000 \times 8.39883$

B. $\frac{20\ 000\ 000}{1\ 000} \times 9.71225$

C. $20\ 000\ 000 \times 9.71225$

D. $\frac{20\ 000\ 000}{1\ 000} \times 8.39883$

Use the following information to answer the next question.

Upon retirement, a person buys a \$5 000 present value annuity. The interest rate is 18% per annum, compounded monthly. Monthly payments of \$250 are made to the person. The person made the following spreadsheet.

Period	Previous Balance (\$)	Monthly Interest Rate (%)	Monthly Payment (\$)	New Balance (\$)
1	5 000.00	1.5	250.00	4 825.00
2	4 825.00	1.5	250.00	4 647.38
3	4 647.38	1.5	250.00	<i>b</i>

Numerical Response

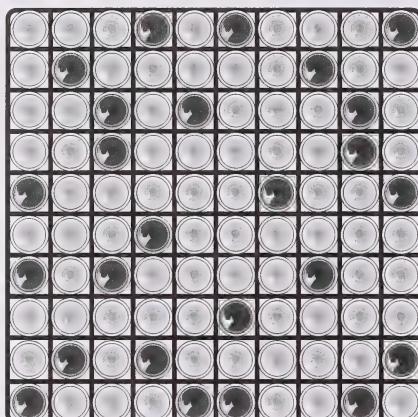
5. The balance after the third monthly payment, *b*, to the nearest dollar, is
\$_____.

(Record your answer in the numerical-response section on the answer sheet.)

Use the following information to answer the next question.

A microbiologist took 100 small samples of water from a river running through a particular property. In the lab, she placed them into a sample tray. To each sample, she added a chemical indicator that changes the colour of the water if a particular kind of bacteria is present.

Sample tray



-  Bacteria present
-  No bacteria present

Written Response—5 marks

2. a. Of the 100 samples in the sample tray, the number of samples that contain bacteria is _____.

b. Based on her results, the microbiologist can infer, with 90% confidence, that the percentage of all possible samples of size 100 that contain bacteria is between _____ % and _____ %.

Use the following additional information to answer the next question.

According to a city regulation, the microbiologist must be 90% confident that the percentage of samples containing bacteria is **less than** 15%.

c. • Explain whether or not the river water exceeds this limit.

• Use the 90% box plot tables from your data booklet to determine the maximum number of samples with bacteria present that a sample tray of 100 can have in order for the microbiologist to be 90% confident that the river water contains **less than** 15% bacteria.

CONNECTIONS

For the next set of questions, you can transfer the skills and procedures that you learned when simplifying fractions and polynomial expressions to working with rational and radical expressions. You can also apply your knowledge of statistics and your understanding of the relationships between functions and graphs.

12. Survey-takers know that the length of a confidence interval decreases as the

- A. sample size increases
- B. sample size decreases
- C. population size increases
- D. population size decreases

13. If $\frac{3\sqrt{5} - 7\sqrt{2}}{\sqrt{10}}$ is simplified to the form $\frac{a\sqrt{2} - 14\sqrt{b}}{10}$, then the value of b is

- A. 4
- B. 5
- C. 15
- D. 20

Numerical Response

6. If $\sqrt{7}(5 + 2\sqrt{5})$ is expanded to the form $5\sqrt{b} + c\sqrt{d}$, where $c \geq 1$, then the value of d , correct to the nearest whole number, is _____.

(Record your answer in the numerical-response section on the answer sheet.)

Numerical Response

7. If $\sqrt{28} + \sqrt{128} - \sqrt{50}$ is simplified to the form $a\sqrt{b} + c\sqrt{d}$, where $a < c$ and a and c are whole numbers greater than 1, then the value for

a is _____ (Record in the **first** column.)
b is _____ (Record in the **second** column.)
c is _____ (Record in the **third** column.)
d is _____ (Record in the **fourth** column.)

(Record **all four digits** of your answer in the numerical-response section on the answer sheet.)

Use the following information to answer the next question.

A student tried to solve the radical equation $\sqrt{4x + 1} - 1 = x$ using the following steps.

Step I $\sqrt{4x + 1} = x + 1$

Step II $4x + 1 = x^2 + 1$

Step III $0 = x^2 - 4x$

Step IV $0 = x(x - 4)$

14. The student's first error was made in

- A. step I
- B. step II
- C. step III
- D. step IV

15. If $\frac{2}{x-3} + \frac{3}{x^2-9}$, where $x \neq -3$ or 3 , is written as a single rational expression, then it is equivalent to

A. $\frac{5}{x^2 + x - 12}$

B. $\frac{5}{x^2 - 9}$

C. $\frac{2x - 3}{x^2 - 9}$

D. $\frac{2x + 9}{x^2 - 9}$

Use the following information to answer the next question.

To solve the rational equation $\frac{4x+3}{x} + \frac{5}{x+2} = 7$, where $x \neq 0$ or -2 , a student wrote the following steps.

Step I $\frac{2(4x+3)}{x+2} + \frac{5}{x+2} = \frac{7(x+2)}{x+2}$

Step II $8x + 6 + 5 = 7x + 14$

Step III $8x + 11 = 7x + 14$

Step IV $x = 3$

16. When the student analyzed his work, he saw that he had made an error in

A. step I
B. step II
C. step III
D. step IV

17. When the rational expression $\frac{6x^2 + 11x - 10}{2x^2 + 5x} \div \frac{9x^2 - 4}{12x + 8}$, where $x \neq -\frac{5}{2}, 0, -\frac{2}{3}$, or $\frac{2}{3}$, is simplified to the form $\frac{a}{x}$, the value of a is

A. -5
B. 4
C. 16
D. 20

Use the following information to answer the next question.

A student simplified a rational expression using the following steps.

Step I	$\frac{2x^2 - 11x + 5}{x^2 - 25}$
Step II	$\frac{(2x - 1)(x - 5)}{(x - 5)(x + 5)}$
Step III	$\frac{(2x - 1)}{(x + 5)}, x \neq -5$

18. Which of the following statements correctly refers to one of the steps above?

A. In step II, the student incorrectly factored the numerator.
B. In step II, the student incorrectly factored the denominator.
C. In step III, the student correctly simplified the expression.
D. In step III, the student correctly determined all the non-permissible values for x .

Use the following information to answer the next question.

A student who was simplifying the rational expression

$$\frac{4}{x^2 - 9} + \frac{3x}{x^2 - 7x + 12}$$

began to factor the denominator as indicated in the step below.

Step I $\frac{4}{(x + 3)(\quad)} + \frac{3x}{(x - 3)(x - 4)}$

Written Response—5 marks

3. a. In step I, the missing factor in the denominator on the left side of the expression is _____.

b. State the non-permissible values of x for the expression shown above, and explain why x cannot equal these values.

c. Complete the simplification of the rational expression by showing all the other steps needed to complete the student's work.

19. If a student were to sketch the graph of the quadratic function $y = (x - h)^2 + k$, the vertex of the function would be

A. $(-h, k)$
B. $(-h, -k)$
C. (h, k)
D. $(h, -k)$

20. The equation $0 = 2x^2 - 6x + c$ can be solved by using the quadratic formula that results in

A. $x = \frac{6 \pm \sqrt{36 - 8c}}{4}$
B. $x = \frac{6 \pm \sqrt{36 - 8c}}{2}$
C. $x = \frac{-6 \pm \sqrt{36 - 8c}}{4}$
D. $x = \frac{-6 \pm \sqrt{36 - 8c}}{2}$

21. In a rational expression, non-permissible values are values that make the

A. numerator equal to zero
B. denominator equal to zero
C. numerator negative
D. denominator negative

SPORTS

In individual and team sports, athletes and coaches need to work hard to achieve the best performance possible. Mathematical applications of powers and radicals, trigonometry, and relations and functions are used to improve athletic performance. Apply your skills in these areas to answer the following set of questions.



Use the following information to answer the next question.

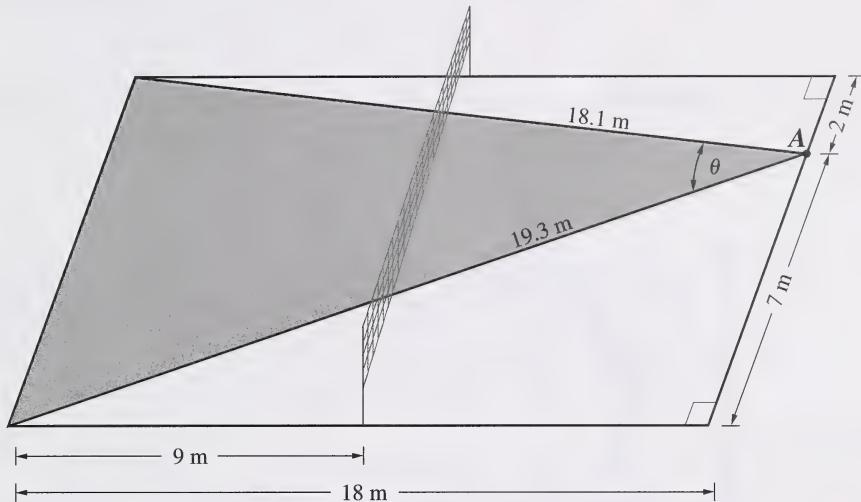
The horizontal distance, d , in metres, that a volleyball travels is related to the time, t , in seconds, that it is in flight. This distance can be represented by the function $d = f(t)$.

22. The difference between the distance travelled by the volleyball in 1 s and the distance travelled by the volleyball in 2 s is given by

- A. $f(1)$
- B. $f(2)$
- C. $f(2) - f(0)$
- D. $f(2) - f(1)$

Use the following information to answer the next question.

In a volleyball game, a player serves the ball from a point A , 2 m from the right sideline. The range of the angle through which the ball must be served in order to stay within the court can be represented by angle θ , as shown below.

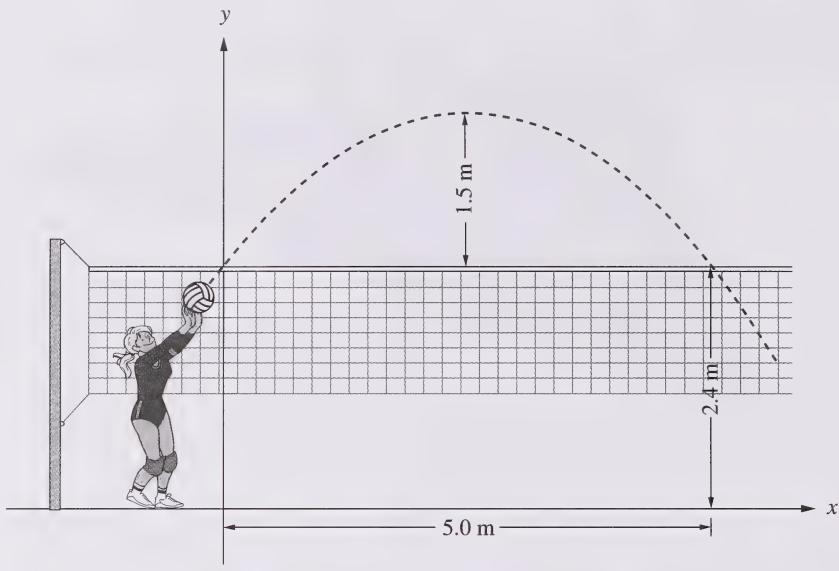


23. The measure of angle θ is

- A. 167.4°
- B. 152.4°
- C. 27.6°
- D. 12.6°

Use the following information to answer the next question.

A volleyball player makes an overhead pass to a teammate. The ball follows a parabolic path, as shown below, that can be represented by the quadratic function $y = a(x - h)^2 + k$.



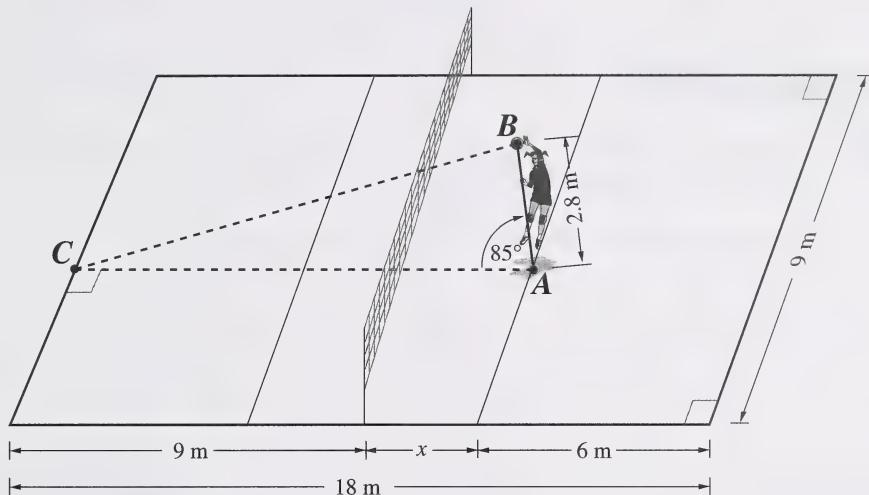
Written Response—6 marks

4.

- The maximum distance of the ball from the floor is _____ m.
- i. What are the coordinates of the vertex of the graph?
- ii. How do the coordinates of the vertex relate to the parameters of the corresponding function $y = a(x - h)^2 + k$?

Use the following additional information to answer the next parts of the question.

Once an overhead pass is complete, a player who is 3 m behind the net jumps into the air, forming an 85° angle with the floor. She makes contact with the ball when it is 2.8 m from her point of take-off as shown in the diagram below.



c. Determine distance \overline{AC} and support your answer mathematically.

d. Calculate \overline{BC} (the distance that the ball travels before hitting the floor), to the nearest tenth of a metre, and show mathematically how you obtained your answer.

Use the following information to answer the next question.

The distance above the floor, d , in centimetres, that a player must jump to reach the top of a volleyball net can be related to the player's height, h , in centimetres, by the function

$$d(h) = 1.16(207 - h)$$

Numerical Response

8. In order to reach the top of the net, a player who is 160 cm tall will need to jump, to the nearest tenth of a centimetre, _____ cm.

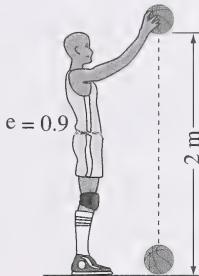
(Record your answer in the numerical-response section on the answer sheet.)

Use the following information to answer the next question.

The coefficient of restitution, e , relates the distance, d , from which a ball is dropped, to the height, h , to which it rebounds, and can be represented by the equation

$$e = \sqrt{\frac{h}{d}}$$

A basketball is dropped from a height of 2 m onto a gymnasium floor, as shown below.



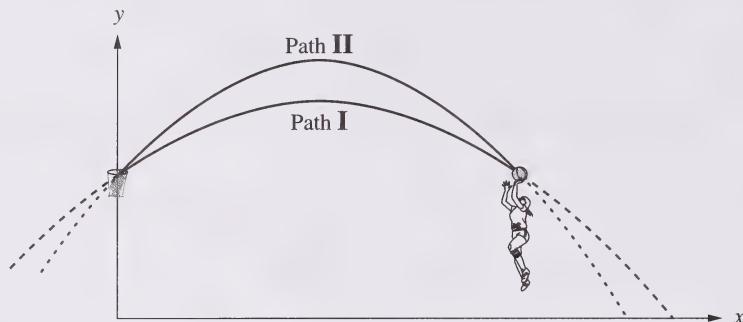
Numerical Response

9. If the coefficient of restitution, e , between the ball and the floor is 0.9, then the height, h , to which the ball bounces, to the nearest hundredth of a metre, is _____ m.

(Record your answer in the numerical-response section on the answer sheet.)

Use the following information to answer the next question.

A basketball player is trying to increase her shot accuracy. She stays in the same position on the court and increases the arc of the flight path of the ball.



Her coach graphs the quadratic function $y = a(x - h)^2 + k$ to model parabolic path I of the basketball. The coach then changes the parameters to graph path II.

24. To create path II from path I, the coach changed

- A. parameters a and h
- B. parameters a and k
- C. parameter h
- D. parameter k

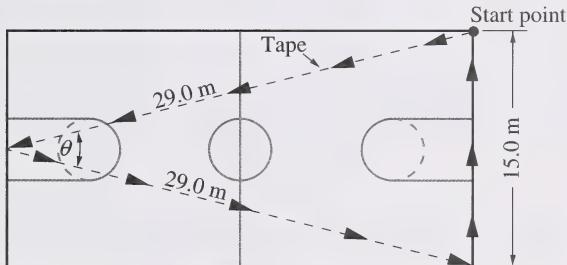
Numerical Response

10. Throughout the season, a basketball player successfully made 40% of the shots she had taken. Given this information and assuming a 90% confidence interval, the number of successful shots that she will make out of 40 random shots will be between 11 and _____.

(Record your answer in the numerical-response section on the answer sheet.)

Use the following information to answer the next question.

In a basketball practice drill, tape is placed along the floor of a basketball court, as shown below. Players must dribble the ball along the tape, in the direction shown.



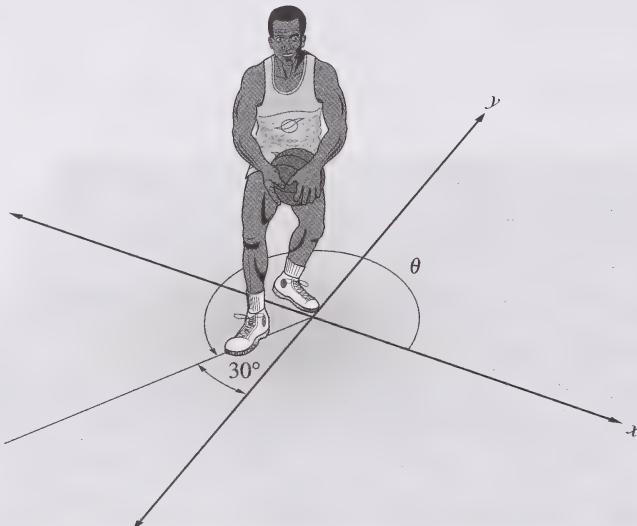
Numerical Response

11. The tape must be laid on the floor in such a way that the measure of angle θ , to the nearest degree, is _____°.

(Record your answer in the numerical-response section on the answer sheet.)

Use the following information to answer the next question.

An important skill in basketball is pivoting. A particular player planted his left foot and rotated on it, as illustrated on the coordinate plane below.



25. The measure of the angle, θ , through which the player rotated, is

- A. 240°
- B. 120°
- C. -120°
- D. -240°

Use the following information to answer the next question.

A basketball player wishes to attend an international basketball tournament. She invests \$1 600 in a savings account twice a year at 8% per annum compounded semi-annually. She uses the spreadsheet below to determine the amount of money she will have in two years.

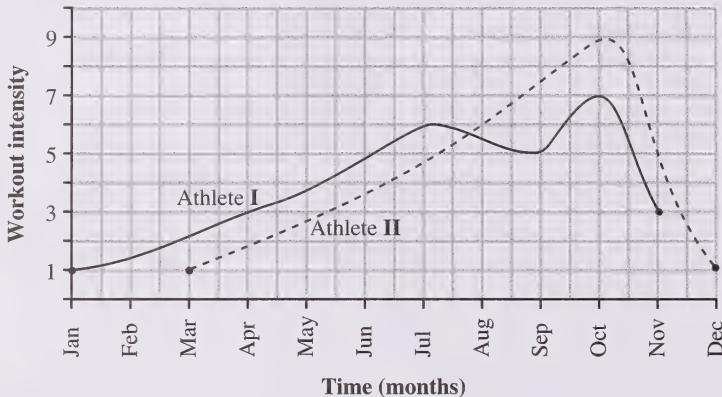
Payment Period	Regular Payment	New Balance	Interest Per Period	Final Balance
1	\$1 600	\$1 600.00	$\$1\,600 \times 0.04 = \$\ 64.00$	\$1 664.00
2	\$1 600	\$3 264.00	$\$3\,264 \times 0.04 = \130.56	\$3 394.56
3	\$1 600	\$4 994.56		
4	\$1 600			<i>b</i>

26. The final balance, *b*, after 2 years will be

- A. \$8 666.11
- B. \$7 066.11
- C. \$6 794.34
- D. \$5 194.24

Use the following information to answer the next two questions.

The graph below depicts the intensity of the workouts for two athletes during a season of play. For each athlete, the intensity of the workout is a function of the time of year. Intensity is measured on a scale of 0 to 10. Throughout the year, intensity varies as the athletes prepare for competition.



The greatest increase in workout intensity for Athlete II occurs between i and ii.

27. The statement above is completed by the words in row

	<i>i</i>	<i>ii</i>
A.	March 1	May 1
B.	April 1	June 1
C.	August 1	October 1
D.	October 1	December 1

28. The domain of the graph of the function for Athlete I is

- A. January 1 to November 1
- B. March 1 to December 1
- C. intensity 1 to 9
- D. intensity 1 to 7

TECHNOLOGY

Computer and graphing calculator technology can be used to display, analyze, interpret, and explore the relationships between tables of values, equations, and graphical representations on a coordinate plane. Use the understanding and familiarity with technology you have gained from your mathematics course to answer the next set of questions.



29. The function $f(x) = 100(0.975)^x$ is an example of

- A. a cubic function
- B. a quadratic function
- C. a reciprocal function
- D. an exponential function

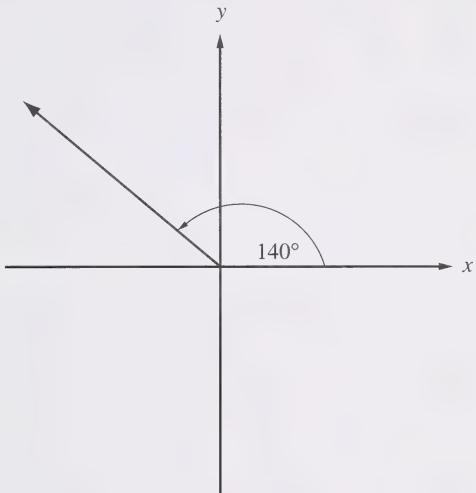
Numerical Response

12. A person obtains a mortgage of \$100 000.00 to buy a particular house. If the interest rate is 9.5% per annum on a 25-year mortgage, then the monthly payments, correct to the nearest dollar, will be \$_____.

(Record your answer in the numerical-response section on the answer sheet.)

Use the following information to answer the next question.

An angle of 140° is placed on a coordinate plane in standard position, as shown below.

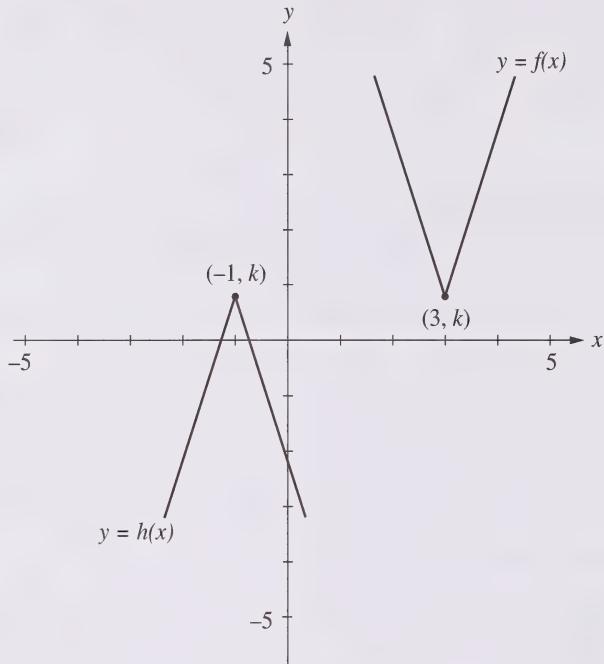


30. The reference angle for this angle is

- A. -140°
- B. -40°
- C. 40°
- D. 140°

Use the following information to answer the next question.

The graph of the function $f(x) = a|x - 3| + k$, where $a > 0$ and $k > 0$, and a transformed graph $y = h(x)$ are shown on the coordinate plane below.



31. An equation that represents the function $h(x)$ is

A. $h(x) = a|x - 1| + k$

B. $h(x) = a|x + 1| + k$

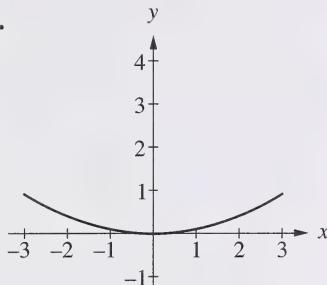
C. $h(x) = -a|x - 1| - k$

D. $h(x) = -a|x + 1| + k$

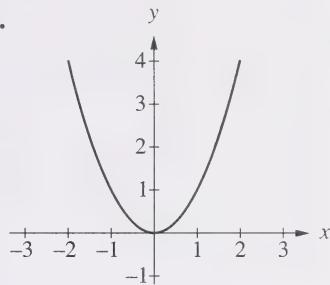
Use the following information to answer the next question.

Four graphs of functions in the form $y = ax^2$ are shown below.

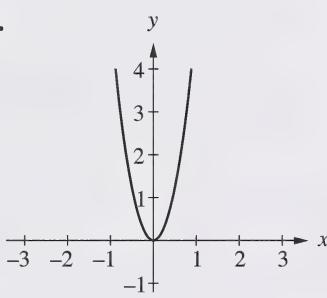
I.



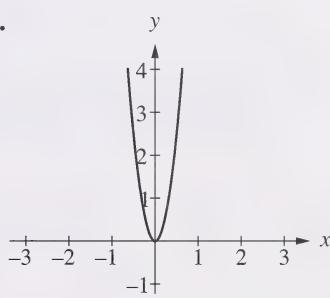
II.



III.



IV.

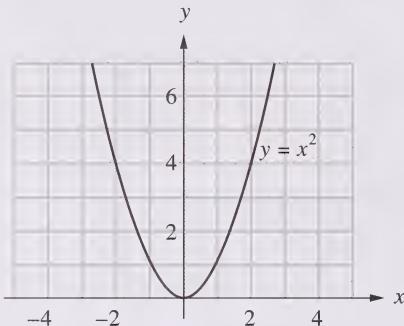


32. The graph representing the function with the largest value of a is

- A. graph I
- B. graph II
- C. graph III
- D. graph IV

Use the following information to answer the next question.

A student observed that the graph represented by the equation $y = x^2$ is a parabola with its vertex at the origin, as shown below.



The student transformed the equation $y = x^2$ so that the shape and direction of its graph remained the same, but the vertex moved to (h, k) .

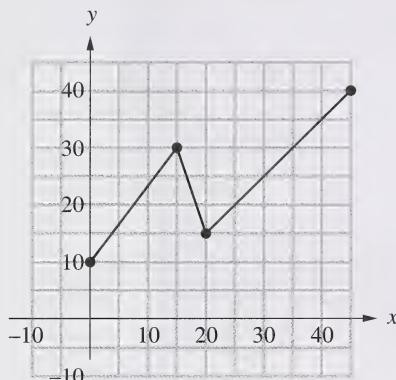
33. The equation that represents the transformed function is

- A. $y = (x - h)^2 + k$
- B. $y = (x + h)^2 - k$
- C. $y = (x + h)^2 + k$
- D. $y = (x - h)^2 - k$

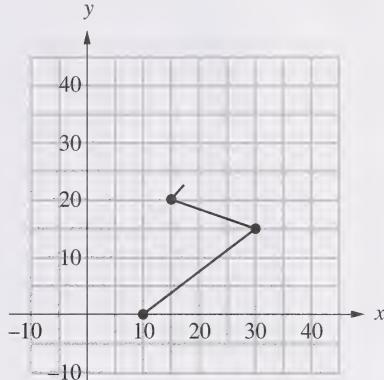
Use the following information to answer the next question.

The graph of $y = f(x)$ and the partially drawn graph of the inverse of $y = f(x)$ are shown below.

Graph of $y = f(x)$



Graph of Inverse of $y = f(x)$



34. If the graph of the inverse of $y = f(x)$ were completed, then it would pass through point $(35, k)$, where the value of k is

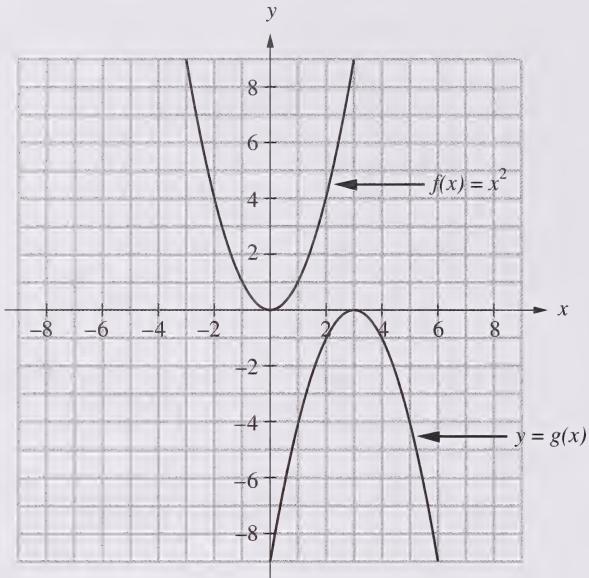
A. 30
B. 35
C. 40
D. 45

35. The graph of a quadratic function intersects the x -axis at points $(1,0)$ and $(7,0)$, respectively. The equation of the axis of symmetry for the graph of this function is

A. $x = 7$
B. $x = 4$
C. $y = 4$
D. $y = 1$

Use the following information to answer the next question.

The graph of the quadratic function $f(x) = x^2$ and the graph of the transformed function $y = g(x)$ are shown below.

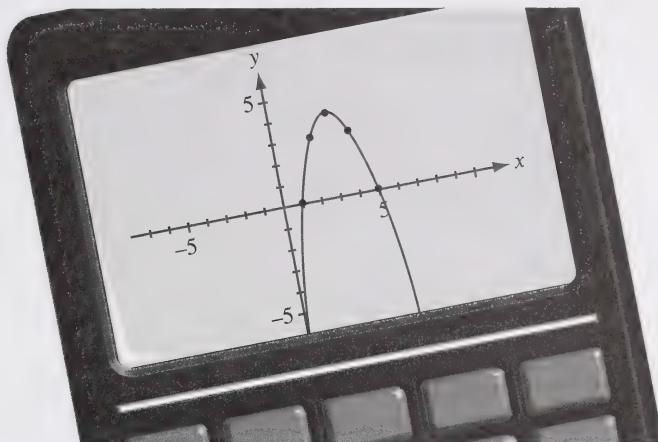


36. The function $y = g(x)$ can be expressed as

- A. $y = (x + 3)^2$
- B. $y = (x - 3)^2$
- C. $y = -(x + 3)^2$
- D. $y = -(x - 3)^2$

Use the following information to answer the next question.

The equation $y = -(x - 3)^2 + 4$ was graphed, as shown below.



37. The x -intercepts of the graphed function are

- A. 0 and -2
- B. 1 and 5
- C. 2 and 3
- D. 4 and 3

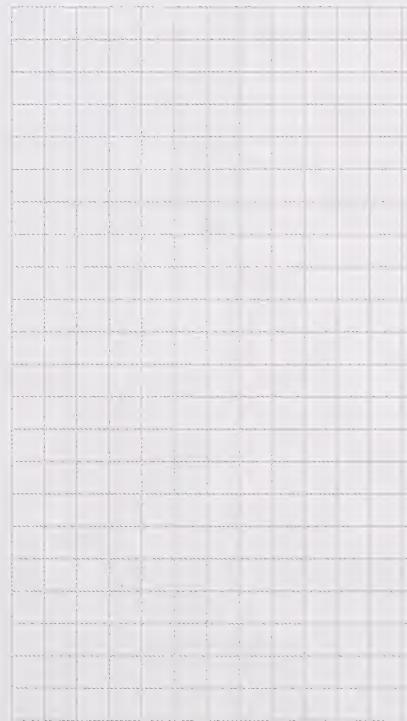
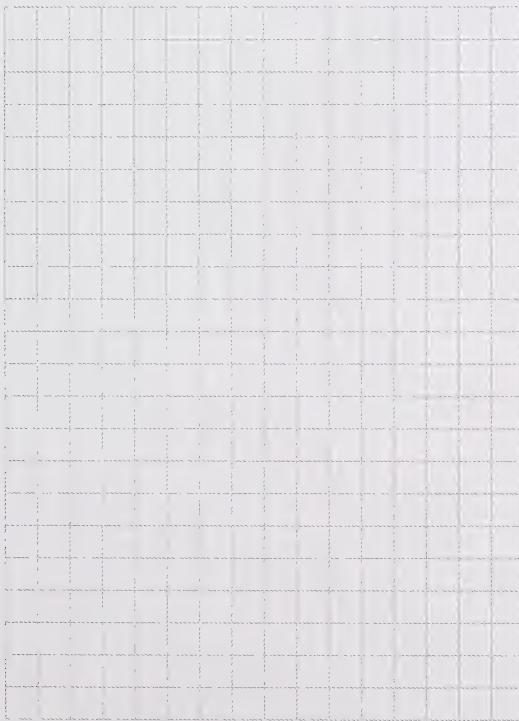
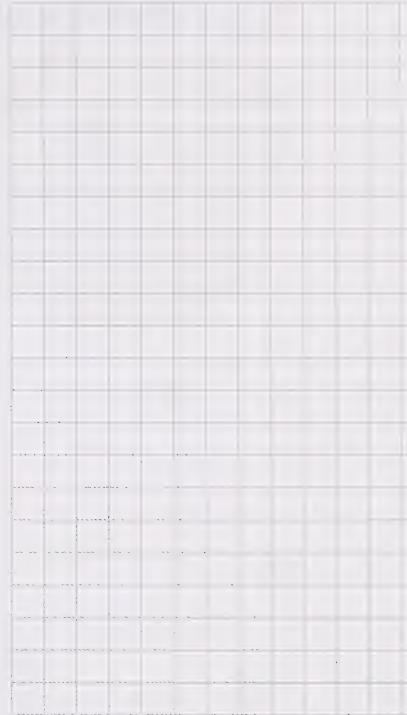
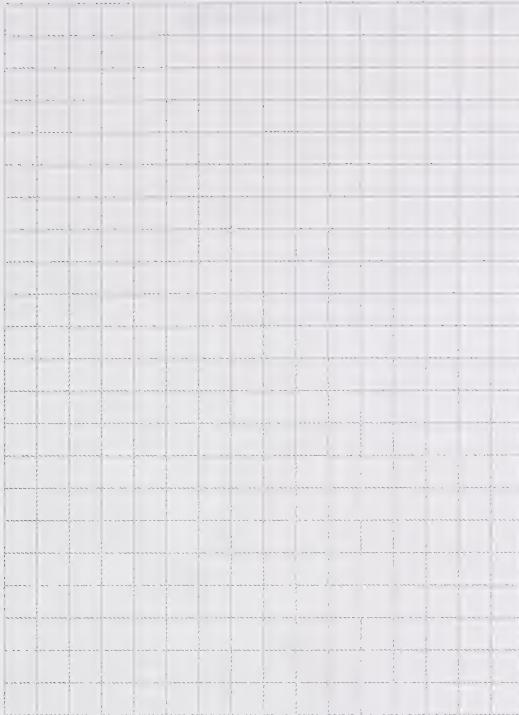
*You have now completed the examination.
If you have time, you may wish to check your answers.*

Credits

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Mathematics 33

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